CLAIMS

1. A firing furnace comprising a combusting means for combusting a fuel containing methane flown therein for generating a combustion gas, and a firing furnace main body for heating and firing a member to be fired, that has been conveyed into the inside thereof, by a combustion gas and exhausting the combustion gas after firing the member to the outside,

wherein a methane reforming device filled with a methane reforming catalyst in the inside thereof, for producing a reformed gas containing hydrogen and carbon dioxide by contacting a reforming material composed of a methane sub fuel for reformation having methane flown therein as a major component and steam with the methane reforming catalyst while heating the material by the combustion gas so as to make methane in the reforming material react with steam, is further provided.

2. The firing furnace according to claim 1, wherein the methane reforming device is provided in the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas so as to produce a reformed gas.

3. The firing furnace according to claim 1, wherein the methane reforming device is provided outside the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas exhausted to the outside of the firing furnace main body so as to produce the reformed gas.

4. The firing furnace according to claim 1, further comprising a fuel cell for generating electricity by the reaction of hydrogen and oxygen or air, wherein a part or the entirety of hydrogen contained in the reformed gas is used for reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell.

5. The firing furnace according to claim 1, further comprising a hydrogen separating device for separating the reformed gas produced in the methane reforming device by flowing the reformed gas into the inside thereof for selectively separating hydrogen in the reformed gas into a hydrogen fuel containing hydrogen as a major component and a residual gas containing carbon dioxide.

6. The firing furnace according to claim 5, wherein a part or the entirety of the hydrogen fuel is used for reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell.

7. The firing furnace according to claim 5, wherein a part or the entirety of hydrogen fuel is mixed with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

8. The firing furnace according to claim 5, wherein a part of hydrogen fuel is used for reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell, remainder part is mixed with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

9. The firing furnace according to claim 7, wherein the volume ratio of the methane sub fuel for reformation and the methane main fuel for mixture (methane sub fuel for reformation : methane main fuel for mixture) is 5:95 to 100:0.

10. The firing furnace according to claim 8, wherein the volume ratio of the methane sub fuel for reformation and the methane main fuel for mixture (methane sub fuel for reformation : methane main fuel for mixture) is 5:95 to 100:0.

11. The firing furnace according to claim 5, wherein the residual gas exhausted from the hydrogen separating device is combusted by firing means.

12. The firing furnace according to claim 5, further comprising a carbon dioxide fixing device for fixing carbon dioxide in the residual gas separated by the hydrogen separating device not so as to discharge it in a gas state to the outside thereof.

13. The firing furnace according to claim 12, wherein the carbon dioxide fixing device contains sodium hydroxide as a fixing agent for fixing carbon dioxide so as to produce sodium carbonate by making sodium hydroxide react with carbon dioxide.

14. The firing furnace according to claim 1, wherein the firing furnace main body is a firing furnace main body of continuous type for conveying a member to be fired continuously into the inside thereof and conveying the member continuously to the outside after heating the member to be fired in the inside thereof.

15. The firing furnace according to claim 1, wherein at least

one of the methane sub fuel for reformation and the methane main fuel for mixture is a liquefied natural gas (LNG).

16. The firing furnace according to claim 1, wherein the material of the member to be fired is a ceramic.

17. The firing furnace according to claim 1, wherein the member to be fired has a honeycomb structure.

18. A firing method comprising the steps of

generating a combustion gas by flowing a fuel containing methane into a combusting means and combusting,

introducing the combustion gas generated in the combusting means into the inside of a firing furnace main body,

heating and firing a member to be fired conveyed into the inside by the combustion gas, and

exhausting the combustion gas after firing to the outside of the firing furnace main body,

wherein a reforming material composed of a methane sub fuel for reformation having methane flown therein as a major component and steam is flown into a methane reforming device filled with a methane reforming catalyst in the inside thereof, and

wherein the reforming material is contacted with the methane reforming catalyst while heating the material by combustion gas so as to make methane in the reforming material react with steam for producing a reformed gas containing hydrogen and carbon dioxide.

19. The firing method according to claim 18, wherein the methane reforming device is provided inside the firing furnace

main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas so as to produce a reformed gas.

20. The firing method according to claim 18, wherein the methane reforming device is provided outside the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas exhausted to the outside of the firing furnace main body so as to produce a reformed gas.

21. The firing method according to claim 19, wherein the methane reforming device is provided outside the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas exhausted to the outside of the firing furnace main body so as to produce a reformed gas.

22. The firing method according to claim 18, wherein a part or the entirety of hydrogen contained in the reformed gas reacts with oxygen or air in the fuel cell as hydrogen for the fuel cell for the power generation.

23. The firing method according to claim 18, wherein the reformed gas produced in the methane reforming device is flown into the inside of a hydrogen separating device for selectively separating hydrogen in the reformed gas into hydrogen fuel containing hydrogen as a major component and a residual gas containing carbon dioxide.

24. The firing method according to claim 23, wherein a part or the entirety of hydrogen fuel is used for reaction with oxygen

or air in the fuel cell as hydrogen for the fuel cell.

25. The firing method according to claim 23, wherein a part or the entirety of hydrogen fuel is mixed with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in combusting means.

26. The firing method according to claim 23, wherein a part of hydrogen fuel is used for reaction with oxygen or air in the fuel cell, remainder part is mixed with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

27. The firing method according to claim 25, wherein the methane sub fuel for reformation and the methane main fuel for mixture are used with the volume ratio (methane sub fuel for reformation : methane main fuel for mixture) of 5:95 to 100:0.

28. The firing method according to claim 26, wherein the methane sub fuel for reformation and the methane main fuel for mixture are used with the volume ratio (methane sub fuel for reformation : methane main fuel for mixture) of 5:95 to 100:0.

29. The firing method according to claim 23, wherein the residual gas exhausted from the hydrogen separating device is combusted in the firing means.

30. The firing method according to claim 23, wherein the residual gas separated in the hydrogen separating device is flown into a carbon dioxide fixing device for fixing carbon dioxide in the residual gas not so as to discharge it in a gas

state to the outside thereof.

31. The firing method according to claim 30, wherein the carbon dioxide fixing device contains sodium hydroxide as a fixing agent for fixing carbon dioxide so as to produce sodium carbonate by making sodium hydroxide react with carbon dioxide.

32. The firing method according to claim 18, wherein a firing furnace main body of continuous type for conveying the member to be fired continuously into the inside and conveying the member continuously to the outside after heating the member to be fired in the inside is used as the firing furnace main body.

33. The firing method according to claim 18, wherein a liquefied natural gas (LNG) is used as at least one of the methane sub fuel for reformation and the methane main fuel for mixture.

34. The firing method according to claim 18, wherein a ceramic is used as the material of the member to be fired.

35. The firing method according to claim 18, wherein a honeycomb structure is used as the member to be fired.